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Factors that Cause Recurrent Stroke amongst Ischemic Stroke Patients: A Literature Review

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Abstract

In patients, recurrent stroke is prevalent and could be avoided, but at the same time, stroke could recur due to various reasons. These comprised the same causes as it caused the initial stroke and with the incorporation of risk factors, like smoking, obesity, and diabetes. The prevalence of recurrent stroke is considered high and could increase as time goes by. As mentioned in research on hemorrhagic stroke, the risk significantly increases overtime, up to 45% within 5 years and if exposed to stroke unit care, the risk will be reduced [1.] However, because of the vagueness in specificity of whether the causes are the same, this research aims to dive into the specific factors that will eventually lead to recurrent stroke. Moreover, this research aims to underscore activities or practices that would reduce the risk of recurrent stroke. Recurrent stroke is seen as a relatively dangerous disease since it could possibly increase the mortality rates in an individual. Therefore, finding the main causes will underscore the significance of preventing recurrent stroke amongst ischemic stroke patients. All data are gathered from different sources of articles and publications to conclude. As a result, factors that cause recurrent ischemic stroke in patients are hypertension, diabetes, smoking, high cholesterol, physical inactivity, alcohol consumption, genetic factors, age, gender, and more.

Keywords: Ischemic Stroke, Recurrent Stroke, Causes of Stroke

1. Introduction

Ischemic stroke is a type of stroke that occurs with a deficit in blood to supply the brain. This could be caused by a blockage in blood vessels. With not enough blood to supply the brain, it will be prevented from getting oxygen and required nutrients [2.] Signs of stroke can be observed using an acronym, BEFAST. These are mainly dedicated to the observation of each part of the body. These consist of the loss of balance, blurred vision, uneven face, weak or uncontrollable arms, having trouble speaking and the speech becomes unclear, and if all that applies, keep in track of time and call stroke emergency numbers which vary between countries. By following these stroke observation guidelines, door-to-needle time could be reduced so that it would be in time to treat using rT-PA [3.]

B	Sudden loss of balance
E	Unclear vision
F	Numbed and uneven face

A	Weak arms
S	Slurred speech
T	Call stroke emergency number

Figure 1 Stroke Management Acronyms [4.]

Due to its severity, it is significant to get the treatment as fast and as instantaneously as possible since it could be deadly [5.] Despite its deadliness, stroke can still be treated within time following the stroke fast track guidelines. Once the patient comes into the hospital, the fast-track cascade needs to be extremely quick and efficient. These processes include consulting neurology medicine ward, then radio CT brain ward and transferring from ER to receive rT-PA. In a determined amount of time, antiplatelets or blood clot dissolving drugs like rT-PA can be given in time. This applies to the patients that are treated within a determined time by prescribing rT-PA (blood clot dissolving drugs.) If the patient could not be treated in time, thrombectomy (removing blood clots in surgery) could still be done to reduce the mortality rate in patients. In the present days, stroke fast tracks are managed efficiently, showing a reducing trend of door to needle time throughout the world [6.]

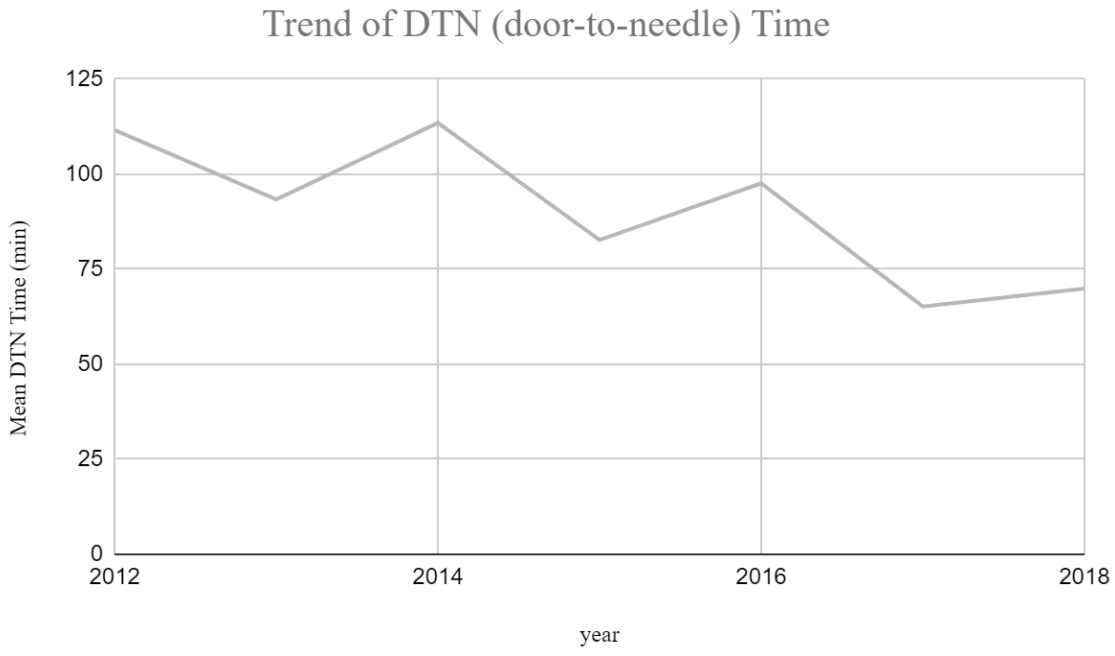

Figure 2 Trend of DTN Time

Even though there are ways that ischemic stroke could be treated, a significant number of patients show signs of having the symptoms again after being treated properly, this can be called a recurrent stroke. A recurrent stroke is a stroke that occurs after the initial stroke has happened before in history, known as second stroke. Previous researchers have found that second stroke is about 25% prevalent amongst patients, that in 4 patients, 1 will most likely exhibit stroke recurrence [7.] Recurrent stroke will most likely lead to more problems and increase the mortality rate. This could possibly lead to death and disability in an

individual [8.] A 2021 study has shown that in comparison to patients with initial stroke, the patients with secondary stroke exhibit "significant cognitive and physical disability" and are severely impacted by the disease [9.] Hence, the treatment and stroke unit care should be done as soon as the initial ischemic stroke has been treated to ensure the low probability of having stroke recurrence in the future.

2. Background Information

Recurrent stroke has been occurring amongst ischemic patients for a long time. However, it is not guaranteed that all the patients will experience a recurrent stroke. With good management and rehabilitation, it could lead to ischemic stroke patients being fully recovered. This proves that there are specific causes that would eventually lead to recurrent stroke. While the percentage of having recurrent stroke is high amongst ischemic stroke patients, up to 23% of the patients will experience recurrent stroke [10.] Most of the publications have stated that the causes of recurrent strokes are the same as factors that led to the initial stroke. However, prior research on the factors that cause multiple recurrent strokes have stated that there are some significant differences in causes of recurrent stroke such that patients with congestive heart disease and diabetes are in more risk of having multiple recurrent strokes [11,] these conditions can be tied to things like eating behaviors and their physical activities which will be further determined in the research. Based on the findings, prior research also has stated that the causes of stroke recurrence are "multifactorial" and that most of the causes remain questions due to more than one risk factor that led to recurrent strokes [12.]

3. Methodology

This literature review will be done by gathering and obtaining data from previous researchers that can be found on research database websites, these include Google Scholar, PubMed, EBSCO, AHA journals, and more by following the guidelines of literature review revised in "Ten Simple Rules of Writing a Literature Review" [13.] Significant keywords are being searched and narrowed down to ensure that the publication is valid and matches the aim of this research, for example, stroke, ischemic stroke, causes of stroke, recurrent stroke, causes of recurrent stroke (see figure 3.) The review is being divided into five batches, each of them narrowed down for the best and most relevant selection of publications, articles, and sites to review. In total, of around 30 articles, websites, research, and publications were viewed and reviewed in order to come to a conclusion of the results and discussions. In the process of selecting articles, irrelevant articles and first, were skimmed to see whether the content meets the requirements of those keywords (figure 3.) If not, those documents, for example, hemorrhagic stroke-related or rehabilitation-related, will be considered as irrelevant and do not meet the needs for the research purposes. All the data gathered from various research sources will then be distributed into different categories and draw conclusions based on each factor found within articles, websites, and publications.

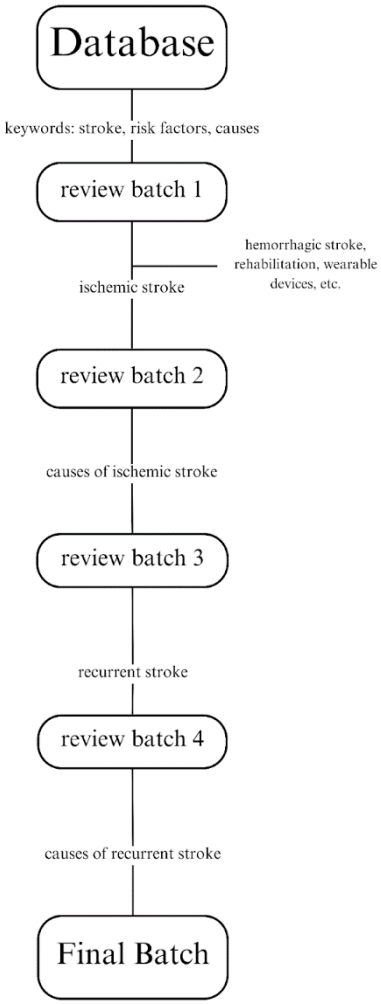

Figure 3 Literature review management and selection of publications

4. Results

After researching and reading through more than 20 sources of articles, publications, and sites, it can be concluded that there are around 5 main factors (which will include subfactors) that will emerge the risk of stroke recurrence. These consist of physical health problems, consumption behaviors, genetic factors, physical behaviors, and age and gender. With all these factors, coupled with the past of having an initial stroke, they present higher risk of having recurrent stroke.

4.1 Physical Health Problems

Prior research entitled "Lifestyle, clinical, and occupational risk factors of recurrent stroke among the working-age group: A systematic review and meta-analysis."
have stated that common NCDs (non-communicable diseases) can significantly increase the risk of stroke recurrence by more than 50%. These factors include hypertension, cardiac diseases, and more that would also apply to the other factors [14.] It is believed that with these factors, it could significantly lead to stroke recurrence, which is more difficult to treat in comparison to an initial stroke [15.] With high blood pressure (hypertension) this is the same risk factor that causes stroke in general, not just a recurrent stroke. However, these factors; hypertension and atrial fibrillation (Afib) are factors that would eventually lead to strokes.

As seen to be physical health problems, it may be hard to prevent these factors from occurring. However, managing and controlling blood pressure and managing atrial fibrilation with anticoagulant [16] medications are crucial in preventing strokes, both initial and recurrent.

4.2 Consumption Behaviors

Eating habits and eating healthily are important. Undeniably, eating could significantly impact health, and recurrent stroke as well. This is because eating unhealthily could result in two of the conditions stated above, atrial fibrillation and hypertension. Diets with high saturated fat, trans fat, and sodium will most likely lead to recurrent stroke, this is because all those fats could cause a blockage in blood vessels, leading to stroke [17.] Ensuring a balanced diet, with a bit of sodium and fats and more proteins, fruits, and vegetables, will ensure a healthier life which will reduce the risk of having a recurrent stroke after an initial stroke. Although it is similar to a general cause of an initial stroke, it shows a presence of difference in research. It has been stated that these stimuli are more detectable in stroke recurrence due to previous stroke that makes it easier to have stroke recurrence [18.] Prior research has shown that the Mediterranean diet (a diet that includes whole grains, fruits, vegetables, and other healthy foods) and stroke shows an inverse relationship between each other [19.]

4.3 Genetic Factors

Genetic factors also play roles within the complications of causes of recurrent stroke and stroke in general. These factors include family history of having cerebrovascular disease (a condition that leads to blood flow and blood vessels in the brain not functioning appropriately and correctly,) high blood pressure, and parental history of stroke or occurrence of stroke within a family member. With these factors coupled with general causes of stroke, it significantly raises the risk of having stroke recurrence. As seen in prior research on traditional risk factor combined with genetic markers of recurrent ischemic stroke in adults, “the risk of AIS recurrence was 36.2% within 5 years [22.]” This shows how all the factors combined to each other could significantly impact health and well-being of an individual that shows history of having a stroke, preventing them from a stroke recurrence. Though this is an uncontrollable and non-modifiable factor, it is crucial to be aware of the genetic risk of ischemic stroke which could be inherited to the patient [23.]

4.4 Physical Behaviors

There are several things that could exponentially increase the risk of the occurrence of recurrent stroke. These things could lead to damage to the body. These factors include smoking, drinking, taking drugs, and being physically inactive. Research on the association between physical activities and stroke recurrence has provided the results, saying that the patients that participate in physical mild exercises have lower rate of stroke recurrence amongst the other ischemic stroke patients [24.] This shows that being physically active could improve all health conditions, including reducing the risk of having ischemic stroke recurrence. Moreover, with the use of smoke and alcohol, it could increase the risk due to body systems being disturbed. According to a journal on the impact of alcohol consumption and cigarette smoking on stroke among elderly in Taiwan, it has stated that the association between alcohol drinking and smoking is present. Patients that participate in those activities are more likely to have strokes and this also applies to recurrent strokes [25.]

4.4.1 Smoking Cigarettes

Smoking is one of the main causes of more other diseases apart from strokes, this is because smoking cigarettes significantly affect the body organs and systems, leading to diseases and conditions like lung cancer and stroke. Research has been done to show that the effect of smoking cigarettes on recurrent ischemic stroke is present, saying that smoking could elevate the risk of ischemic stroke recurrence [26.] Hence, in order to reduce the risk of recurrent stroke, the smoking of cigarettes should be reduced.

4.4.2 Drinking Alcohol

Alcohol drinking also shows a positive correlation with the occurrence of ischemic stroke recurrence. As suggested by the Stroke Association, it has been said that drinking alcohol contributes to higher risk of having a stroke by increasing the other risk factors, such as high blood pressure and diabetes type 2 [27.] Alcohol can significantly increase the risk of stroke and other diseases; hence, the practice should also be avoided along with cigarette smoking.

4.5 Age and Gender

Age could also play a role in the scale of risk of stroke recurrence. Research on an increasing risk of ischemic stroke associated with age has shown that about three-quarters of stroke happen within the patients of the age 65 years or older [28.] Hence, it can be concluded that patients that are older are far more likely to experience stroke recurrence within a year or longer. Results on another population research regarding the same topic also has shown that the rate of stroke recurrence in patients over 65 years are higher than the other age groups below [29.] Another factor that could influence the rate of stroke recurrence is gender. According to statistical analysis of research, it has shown that the difference between stroke recurrence occurring in each gender has decreased. However, it is also present that women are more likely to experience stroke recurrence according to research [30.] Women are more likely to experience stroke and stroke recurrence, because the risk increases along with age. It is more likely that women will live longer than men, hence, more risk of stroke [31.]

5. Conclusion

Stroke is a leading cause of death in the world, over one-fourth of adults (aged 25 and above) will experience stroke in their lifetime. After an initial ischemic stroke, there is also a high chance for patients to have a “second stroke,” or stroke recurrence. The leading factors that lead to recurrent strokes are similar to the factors that initiated the initial stroke at first. However, there are some differences between those. Once an initial stroke has occurred, the body will be more sensitive and responsive to the risk factors, leading to recurrent stroke. These main reasons are physical health problems, consumption behaviors, genetic factors, physical behavior, age, and gender. Some of the factors are contributed to the body, known as non-modifiable factors, therefore, it is impossible to avoid. However, factors that can be adjusted, such as physical inactivity, eating behaviors, smoking cigarettes, drinking alcohol, and more, should be avoided to reduce the risk of stroke recurrence within ischemic stroke patients.

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